Oil and gas discovery wells drilled in New Mexico in 1984

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Table 1. Kinney (1967, p. 26–27) presented stratigraphic charts of oil- and gas-producing rock units in southeast New Mexico.

The Delaware Basin, the deep-marine part of the Permian Basin, yielded several significant wildcat discoveries. Oil was discovered in two wells in Pennsylvanian rocks. The Sun No. 1 State O (6) had an initial potential of 296 bbls of oil per day (BOPD) from the Cisco Series. The H. L. Brown, Jr. No. 1 State 32 (8), a workover of an abandoned Morrowan (Pennsylvanian) gas well, had an initial potential of 182 BOPD from the Canyon Series. Oil was found in the Cities Service No. 1 State DW (10) in the Bone Spring Formation (Permian), and this well had an unusually high initial potential of 1,026 BOPD and 25 bbls of water per day (BWPD). The Bone Spring usually produces less than 200 BOPD from individual wells.

Siluro–Devonian rocks in the Getty Oil Co. No. 1 Bunker Hill State (3), and the well had an initial potential of 87 BOPD and 73 BWPD. Gas was found in the Amoco Production Co. No. 1 Federal DH (5) in the Stawn Series (Pennsylvanian).

Development drilling in the Delaware Basin was almost exclusively for oil in 1984; the slack gas market was the major factor that dampened development of gas reservoirs. Major targets for oil drilling were sandstones and limestones of the Bone Spring Formation (Permian) and sandstones of the Delaware Mountain Group (Permian).

Several Bone Spring and Delaware Mountain oil pools have been discovered in the last 5 yrs, and development wells drilled in those pools are usually successful; wells with initial potentials of 100–300 BOPD are com-

Southeast New Mexico

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In 1984, 640 wells were completed in northwest New Mexico; 691 wells were completed in 1983. Almost all of the wells drilled were in the San Juan Basin, which is the only productive basin in this part of the state. The diminished rate of drilling in 1983 and 1984 was caused by a decreased market for gas, which is the primary petroleum product of the San Juan Basin.

Most drilling for oil was concentrated in the Gallup and Dakota Sandstones (Cretaceous) in San Juan and Rio Arriba Counties. In many wells, Gallup and Dakota oil is commingled with oil produced from Graneros Shale, Greenhorn Limestone, and the lower and upper parts of Mancos Shale (all Cretaceous). Many recently completed Gallup wells are located in southwest Rio Arriba County and southeast San Juan County along the main northwest trend of Gallup production. The main Gallup trend produces oil from northwest-trending bar-shaped sandstones. Many wells northeast of the main trend produce oil from sandstones that are less permeable and porous than sandstones in the main Gallup trend (Reese, 1977). Significant oil discoveries in the Gallup were made in the Dugan Production Co. No. 1 McDougall (15), which was drilled southwest of the main Gallup trend, and in the Gary Williams Oil Producer No. 9 Penetast 3 (12).

Development drilling for gas was limited mostly to the Dakota, Chacra, Point Lookout, and Pictured Cliffs Sandstones and to shallow (<1,500 ft) low-volume reservoirs in the Fruitland Formation. The Basin Dakota gas pool in San Juan and Rio Arriba Counties continued to be developed intensely. Stone et al. (1983) discussed the stratigraphy of Cretaceous rocks in the San Juan Basin.

The Gulf Oil Corp. No. 1 Gallo Canyon Federal-State Deep Unit (18) was spudded in 1983 and was completed and abandoned in 1984. The well is significant because it was drilled to a total depth of 12,500 ft and probably penetrated Paleozoic or Precambrian rocks. Only about 25 wildcat wells have been tested in the Paleozoic section in the New Mexico part of the San Juan Basin because most wells stop in shallower Cretaceous pays zones. Paleozoic production is limited to nine small fields in the northwest part of the Basin where the Paleozoic reservoirs are Devonian, Mississippian, and Pennsylvanian. Although no shows were reported from the Gallo Canyon (Paleozoic) section, oil was recovered in the Entrada Sandstone (Jurassic) through casing perforations from 7,434 to 7,435 ft. The little known stratigraphy of Paleozoic rocks in the San Juan Basin has been summarized by Armstrong and Mamet (1977), Jonseth (1977), and Baars and Stevenson (1977).

The Albuquerque Basin was the site of continued activity in 1984. The C. R. Robinson No. 1 Baca (17) was drilled on the Hubbell Bench, a shallow fault block; Pennsylvanian rocks between 1,830 and 1,850 ft were tested, and a small oil show was reported. In the deeper, central part of the basin, the Ute

### TABLE 1—Significant wildcat discoveries in New Mexico in 1984; the term formation is used in an informal sense. BOPD, barrels of oil per day; BWFD, barrels of water per day; MCFGPD, thousand ft³ of gas per day; owwo, old well worked over.

<table>
<thead>
<tr>
<th>Number</th>
<th>Location</th>
<th>Operator, well name, and lease</th>
<th>Completion date (mo,dy)</th>
<th>Total Formation depth (ft)</th>
<th>Production formation</th>
<th>Producing oil (BOPD)</th>
<th>Initial potential</th>
<th>Oil gravity (API)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>26–42–23E, Chaves</td>
<td>Yates Petroleum Corp. No. 3 Explo-</td>
<td>1/84</td>
<td>3,902</td>
<td>Precambrian</td>
<td>2,512</td>
<td>170 MCFGPD</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>13–32–31E, Chaves</td>
<td>Enos Exploration Corp. No. 1 State 13</td>
<td>1/84</td>
<td>12,060</td>
<td>Devonian</td>
<td>10,904</td>
<td>2,000 MCFGPD</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>33–156–31E, Chaves</td>
<td>Getty Oil Co. No. 1 Bonner Hill State</td>
<td>9/84</td>
<td>13,977</td>
<td>Devonian</td>
<td>12,638</td>
<td>87 BOPD +</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>11–75–32E, Roosevelt</td>
<td>Yates Petroleum Corp. No. 1 Smith 21 (owwo)</td>
<td>9/84</td>
<td>10,016</td>
<td>Wolfcampian</td>
<td>8,238</td>
<td>70 BOPD +</td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td>11–185–27E, Edley</td>
<td>Antoo Production Co. No. 1 Federal DJ</td>
<td>10/84</td>
<td>11,915</td>
<td>Ellenburger</td>
<td>9,295</td>
<td>920 MCFGPD</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>12–195–28E, Edity</td>
<td>San Exploration &amp; Production Co.</td>
<td>11/84</td>
<td>1,146</td>
<td>Mississippian</td>
<td>9,526</td>
<td>296 BOPD</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>19–115–35E, Lea</td>
<td>Yates Petroleum Corp. No. 1 Lone Star State AAI (owwo)</td>
<td>12/84</td>
<td>10,625</td>
<td>Pennsylvania</td>
<td>10,375</td>
<td>37 BOPD +</td>
<td>125 BOPD</td>
</tr>
<tr>
<td>9</td>
<td>16–155–37E, Lea</td>
<td>Newmont Oil &amp; Gas No. 1 State 16</td>
<td>2/84</td>
<td>12,148</td>
<td>Atokan</td>
<td>11,231</td>
<td>20 BOPD +</td>
<td>40</td>
</tr>
<tr>
<td>10</td>
<td>12–188–55E, Lea</td>
<td>Cibola Service No. 1 State 1 (owwo)</td>
<td>4/94</td>
<td>11,094</td>
<td>Wolfcampian</td>
<td>8,983</td>
<td>1,050 BOPD +</td>
<td>40</td>
</tr>
<tr>
<td>11</td>
<td>29–295–2E, Lea</td>
<td>Gulf Oil Corp. No. 1 Wilcox Federal C</td>
<td>9/84</td>
<td>15,562</td>
<td>Atokan</td>
<td>15,401</td>
<td>1,140 MCFGPD</td>
<td></td>
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<tr>
<td>12</td>
<td>3–2NN–4V–1, Eddy</td>
<td>Gary Williams Oil Producer Co. No. 2 Permian A</td>
<td>6/84</td>
<td>5,009</td>
<td>Cretaceous</td>
<td>4,940–4,950</td>
<td>40 BOPD</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>9–3NN–4W–1, San Juan</td>
<td>Sovereign Oil No. 1 Sovereign 35–3</td>
<td>4/84</td>
<td>5,181</td>
<td>Levis</td>
<td>2,926</td>
<td>861 MCFGPD</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>12–3NN–10W, San Juan</td>
<td>Dogan Production Co. No. 1 Blonde A</td>
<td>2/84</td>
<td>1,250</td>
<td>Chacra</td>
<td>965</td>
<td>76 MCFGPD</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>17–2NN–10W, San Juan</td>
<td>Dogan Production Co. No. 1 McDougall</td>
<td>1/84</td>
<td>5,412</td>
<td>Dakota</td>
<td>4,140</td>
<td>1,700 BOPD</td>
<td>40</td>
</tr>
</tbody>
</table>

### Northwest New Mexico

The Albuquerque Basin was the site of continued activity in 1984. The C. R. Robinson No. 1 Baca (17) was drilled on the Hubbell Bench, a shallow fault block; Pennsylvanian rocks between 1,830 and 1,850 ft were tested, and a small oil show was reported. In the deeper, central part of the basin, the Ute
Oil No. 1 Westland Development (16) was abandoned at a total depth of 17,500 ft, but it was held "tight" at the end of 1984; principle objectives were probably Upper Cretaceous sandstones. This well was drilled 3 mi south of the Shell No. 1 West Mesa Federal, which was drilled to a total depth of 19,375 ft and abandoned in 1982 after encountering good shows of gas in Upper Cretaceous sandstones. Deep wells drilled in previous years have encountered promising shows of gas in the Albuquerque Basin (Black, 1982). Kelley (1977) and Black (1982) discussed the geology of the Albuquerque Basin.

Yates Petroleum Corp. announced plans to drill five wells in the Española Basin, which continues to be an important exploration target. Three wells will be drilled to depths of 5,000-7,000 ft; principle objectives are Cretaceous sandstones. Two wells will be drilled to depths of 7,000-8,200 ft; principle objectives are Pennsylvania sandstones. Black (1984a) discussed seismically defined Laramide-age folds and thrust faults in the subsurface of the Española Basin. Black (1984b) discussed the present status of petroleum exploration in the Española Basin.

Elsewhere in northwestern New Mexico, two wells were drilled in the Acoma Basin. The Joe Salazar No. 1 State (35) was scheduled to be drilled to 2,900 ft to test the Entrada Sandstone (Jurassic), but was not completed at the end of 1984. The Samedan Oil No. 1 Laguna Federal (36) was drilled to a total depth of 5,450 ft and held "tight" at the end of 1984.

**Northeast New Mexico**

Several petroleum exploration wells were drilled in northeastern New Mexico in 1984. Petroleum has not been produced in this area except for a brief period when marginally commercial amounts of gas were produced from the Morrison Formation (Jurassic) and the Dakota Sandstone (Cretaceous) at the currently inactive Wagon Mound field in Mora County (Brooks and Clark, 1978).

Some of the wells were drilled as a result of Pennsylvania gas and oil discoveries made by Trans-Pecos Resources in 1982 (Fig. 1, A) and by Yates Petroleum Corp. in 1983 (Fig. 1, B) in the Tucumcari Basin. In 1984, the Yates Petroleum Corp. No. 2 T-4 Carrie Co. (20) was abandoned at a total depth of 7,033 ft in Precambrian rocks; Pennsylvania rocks were tested without reported petroleum recovery. The Yates Petroleum Corp. No. 3 T-4 Carrie Co. (21) was abandoned at a total depth of 4,973 ft in Pennsylvania rocks; these rocks were tested but results were not released. The CO2-in-Action No. 1 Hicks (22) was abandoned at a total depth of 7,275 ft after an oil show was encountered in a core of Pennsylvania rocks. The DeSana Corp. No. 1 Allmand (25) was abandoned at 7,160 ft in reported granite wash. Other wells drilled previously in west Currier County have had gas shows in the San Andres Formation (Permian). Pitt and Scott (1981) discussed porosity zonation in the San Andres Formation of east-central New Mexico.

Four significant tests drilled in the Tucumcari Basin were not completed or held "tight" at the end of 1984. The Yates Petroleum Corp. No. 1 T-4 Filly's Tooth (37) was drilled to a total depth of 7,700 ft. The Baker and Taylor No. 1 Reilly Minerals (38) was scheduled to be drilled to 7,500 ft. The Trans-Pecos Resources No. 1 Latigo Ranch Block D (39) was drilled "tight" to a total depth of 7,836 ft and attempts were made to complete that well in Pennsylvania rocks. The McClellan Oil Corp. No. 2 Burner Fee (40) was drilled to 6,100 ft and reportedly encountered shows of oil and gas in rocks that are probably Pennsylvania.

Trans-Pecos Resources initiated a gas-enhanced oil-recovery pilot project at the Trans-Pecos No. 1 Latigo Ranch Block A (Fig. 1, A); in 1982, a small gas discovery was made in Pennsylvania rocks in a depth interval of 6,658-6,764 ft. The object of the enhanced-recovery project is to recover oil from Pennsylvania rocks in a depth interval of 6,165-6,203 ft by injecting gas into the reservoir.

Río Petro Limited continued efforts to recover heavy oil from Santa Rosa Sandstone (Triassic) at the Newkirk oil pool (Fig. 1, C). Río Petro is operating two pilot steam flood projects, the O'Connell Ranch and the T-4 Ranch pilots, in an attempt to recover the oil. Neither pilot project has produced commercial quantities of oil yet. Martin (1984) reported on engineering aspects of the two pilot projects and McKallip (1984) reported on the subsurface geology of the Newkirk pool. Broadhead (1984b) discussed the petroleum geology of the Santa Rosa Sandstone in northwestern New Mexico.

Amoco Production Co. drilled two wells (41, 42) to test the Pennsylvania section in the late Paleozoic-age Taos trough. Casey (1980) discussed upper Paleozoic sediments of the Taos trough.
TABLE 3—Significant wildcat wells that were drilling, not completed, or “tight” at end of 1984 in New Mexico; owdd, old well drilled deeper.

<table>
<thead>
<tr>
<th>Number on Fig. 1</th>
<th>Location (section-township-range, county)</th>
<th>Operator, well number, and lease</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>31-14N-8, Santa Fe</td>
<td>Chaco Oil Co. No. 1 Pintion Unit</td>
<td>Drilled to 3,200 ft to test Cretaceous rocks</td>
</tr>
<tr>
<td>35</td>
<td>36-11N-4W, Cibola</td>
<td>Joe Salazar No. 1 State (owdd)</td>
<td>Schedued to be drilled to 2,900 ft to test Entrada Sandstone (Jurassic)</td>
</tr>
<tr>
<td>36</td>
<td>14-3N-12W, Catron</td>
<td>Samedan Oil No. 1 Laguna Federal</td>
<td>Drilled “tight” to 5,450 ft; scheduled to be drilled to Precambrian basement</td>
</tr>
<tr>
<td>37</td>
<td>12-10N-27E, Quay</td>
<td>Yates Petroleum Corp. No. 1 T-4 Filly’s Tooth</td>
<td>Pennsylvanian test; drilled “tight” to total depth of 7,700 ft</td>
</tr>
<tr>
<td>38</td>
<td>34-9N-25E, Guadalupe</td>
<td>Baker &amp; Taylor No. 1 Reilly Minerals</td>
<td>Scheduled to be drilled to 7,500 ft to test Pennsylvanian rocks</td>
</tr>
<tr>
<td>39</td>
<td>26-10N-23E, Guadalupe</td>
<td>Trans-Pecos Resources No. 1 Latigo Ranch Block D</td>
<td>Drilled to total depth of 7,836 ft in Pennsylvanian rocks</td>
</tr>
<tr>
<td>40</td>
<td>31-11N-22E, Guadalupe</td>
<td>McCollan Oil Corp. No. 2 Burner Fee</td>
<td>Drilled “tight” to total depth of 6,100 ft; oil and gas shows reported in Pennsylvanian rocks</td>
</tr>
<tr>
<td>41</td>
<td>3-20N-17E, Mora</td>
<td>Amoco Production Co. No. 1 Salmon Ranch A</td>
<td>Pennsylvanian test; drilled “tight” to total depth of 10,200 ft</td>
</tr>
<tr>
<td>42</td>
<td>21-21N-17E, Mora</td>
<td>Amoco Production Co. No. 1 Salmon Ranch B</td>
<td>Scheduled to be drilled to 10,200 ft to test Pennsylvanian rocks</td>
</tr>
<tr>
<td>43</td>
<td>12-29N-21E, Collax</td>
<td>Perma Energy No. 3 Kaiser Steel</td>
<td>Drilled “tight” to 3,900 ft; tested Dakota Sandstone (Cretaceous)</td>
</tr>
<tr>
<td>44</td>
<td>18-29N-22E, Collax</td>
<td>Perma Energy No. 1 Kaiser-Edison</td>
<td>Drilled “tight” to 3,510 ft; tested Dakota Sandstone (Cretaceous)</td>
</tr>
<tr>
<td>45</td>
<td>15-185-15E, Otero</td>
<td>Yates Petroleum Corp. No. 1 Dog Canyon Federal VF</td>
<td>Drilled “tight” to total depth of 9,000 ft; scheduled to be drilled to Bliss Sandstone (Cambrian–Orovician)</td>
</tr>
<tr>
<td>46</td>
<td>10-33S-20W, Hidalgo</td>
<td>Arco Oil &amp; Gas Corp. No. 1 Fitzpatrick</td>
<td>Schedued to be drilled to 15,000 ft</td>
</tr>
</tbody>
</table>

Exploration and drilling continued in the not-yet-productive Raton Basin. The Austra-Tex Oil No. 1–Y Phelps Dodge (19) was abandoned at a total depth of 4,295 ft without any reported shows of oil or gas. The Perma Energy No. 3 Kaiser Steel (43) was drilled “tight” to 3,900 ft in the Dakota Sandstone (Cretaceous) and had a gas show in the Dakota. The Perma Energy No. 1 Kaiser-Edson (44) was drilled “tight” to a total depth of 3,510 ft. Promising shows of gas were encountered in several wells drilled in previous years in Cretaceous rocks (Speer, 1976), but commercial production has not been established. Rose et al. (1984) discussed evidence for the presence of an undiscovered basin-centered gas accumulation in Cretaceous sandstones, and Woodward (1984) discussed the occurrence of possible fractured reservoirs in the basin. Exploration in the Raton Basin has been concentrated on the Dakota and Trinidad Sandstones (Cretaceous); deeper targets, the Entrada Sandstone (Jurassic), Triassic sandstones, and the Paleozoic section, remain unevaluated.

The Bravo dome carbon dioxide gas field continued to be developed and 45 wells were completed. The main reservoir is the Tubb Sand (Permian). Carbon dioxide produced from the Bravo dome will be used for enhanced oil recovery in the Permian Basin of west Texas and southeast New Mexico; most of it will be transported by the Bravo pipeline, which was completed last November. The Sheep Mountain pipeline will transport carbon dioxide to the Permian Basin from the Bravo dome field and from the Sheep Mountain field in southeast Colorado (Broadhead, 1985).

Southwest New Mexico

Exploratory drilling for oil and gas continued in southwest New Mexico in 1984. The Exxon No. 1 Mason Draw Federal Unit (33) was drilled about 1 mi east of outcrops of epiplastic Tertiary-age volcanic rocks to a total depth of 11,948 ft before it was abandoned in reported Precambrian rocks. In late 1984, Arco began drilling the Arco No. 1 Fitzpatrick (46), which will be used to test the Lower Cretaceous and Paleozoic sections in the Pedregosa Basin.

Although there is no current petroleum production in southwest New Mexico, there is potential for future production (Greenwood et al., 1977, Thompson, 1980, 1981). Promising shows of both oil and gas have been encountered previously in several wells (Thompson, 1982). Many wells drilled in recent years were located on the assumption that southwest New Mexico is part of the Laramide-age Cordilleran overthrust belt, as proposed by Corbitt and Woodward (1973), Drewes (1978), and Woodward and Duchene (1981). More recent studies indicate that thrust faulting in southwest New Mexico is of local extent only; major Laramide-age structural features are high-angle reverse faults that form basement-cored block uplifts (Brown and Clemons, 1983; Seager, 1983). Recent work also has cast doubt on the presence of the Cordilleran overthrust belt in southeast Arizona (Dickinson, 1984). The well-documented shelf-edge reefs of the Pedregosa Basin (Thompson and Jacka, 1981) have not been drilled in the subsurface where they may contain excellent petroleum reservoirs.

Effect of discoveries on oil and gas production

In 1983, New Mexico was the seventh largest producer of crude oil and the fourth largest producer of natural gas in the United States (Energy Information Administration, 1984, pp. 20, 24). Although production of oil and gas in New Mexico has been declining in recent years, oil production increased in 1983 and 1984 and gas production increased in 1984. Production of crude oil and natural gas liquids in 1983 was 75.2 million bbls, an increase of 5.9% from the 71.0 million bbls produced in 1982. Oil production increased by approximately 4% in 1984 (New Mexico Oil Conservation Division data). Production of natural gas in 1983 was 899 billion ft³, a decrease of 9.2% from the 990 billion ft³ produced in 1982. Gas production increased by approximately 7% in 1984 (New Mexico Oil Conservation Division data). In 1983, 91% of the state’s oil and 56% of the state’s gas was produced in the Permian Basin; 9% of the state’s oil and 44% of the state’s gas was produced in the San Juan Basin. As of December 31, 1983, New Mexico had reserves of 857 million bbls oil and 15.7 trillion ft³ gas. The oil reserves include oil that can be recovered by enhanced-recovery techniques. The increases in oil production in 1983 and 1984 can be attributed to two factors. First, new oil reserves discovered and developed in the last 5 yrs increased the amount of oil available for production. Second, the market for produced oil was good, so that any oil produced could be sold. New Mexico’s oil production should remain stable or increase by a few percent in 1985 because of good demand for oil. Although the short-term price of oil remains in doubt, the general consensus is that oil prices will rise over the long term (Wash, 1985, p. 17), which provides exploration incentive. Most Permian Basin operators predict that drilling activity in 1985 will be similar to what it was in 1984 (Drill Bit, 1985).

Continued oil discoveries in the Permian and San Juan Basins will encourage exploratory drilling and development and should help prevent production declines in the future. Oil play discoveries in the Delaware Mountain Group and the Bone Spring Formation (Permian Basin) in the last 5 yrs provide major new exploration targets and add new oil reserves and production that will supplant declining production from older oil pools. Production declines will be slowed in the more distant future by implementation of carbon dioxide flooding of existing fields; Foster (1980, p. 3) estimated that 4.6–11 million BOPD could be produced with carbon.

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The future of gas production in New Mexico is uncertain because of the unknown demand for and price of gas in the future. A bad effect of decreased gas production in 1982 and 1983 was that exploration decreased markedly; some of the produced gas reserves were not replaced by new discoveries and reserves declined accordingly. Generally, only the very best gas prospects, or those gas prospects required to hold leases, will be drilled in 1985 (Drill Bit, 1985).

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